

**Promoting microbiology in schools and colleges for more than 50 years****CHAIRMAN'S ANNUAL REPORT 2022-2023****Summary**

In 2023, MiSAC's 35<sup>th</sup> annual competition, *Microbes and the Water Cycle*, was sponsored by Thames Water. New publications have included a selection of MiSAC *fun microbiology* materials, MiSAC *methods* 1 *Looking at Microbes*, a new MiSAC *matters* article *Hiding in Plain Sight* and MiSAC *briefings* 5 *As the World Warms - Diseases will Spread*. MiSAC is planning to initiate a *Microbiology in Schools Grant* in which schools can bid for funds to improve their microbiology teaching. The 36<sup>th</sup> annual competition in 2024 will focus on *Neglected Tropical Diseases and Climate Change*, sponsored by the Wellcome Centre for Integrative Parasitology. MiSAC continued to offer authoritative advice to schools, colleges and other organisations in the UK and abroad, including continued collaborations with schools in SE Asia. The Committee held four meetings, one of which was face-to-face and involved judging competition entries; the other meetings used Zoom.

**MiSAC 35<sup>th</sup> Annual Competition 2023, *Microbes and the Water Cycle***

The aim of the 35th MiSAC Annual Competition, sponsored by Thames Water, was to increase an understanding among teenagers of the key roles of microbes in the water cycle. The requirements maintained the well-established approach of basing the competition on a topic that is associated with school curricula but with specifications that require students to explore material beyond the curriculum. It was evident that students had enjoyed researching the topic and demonstrated their enthusiasm in producing an illustrative web-page report in a variety of imaginative ways.

We welcomed back entries from regular school participants, though the number of newcomers to the competition was less than in previous years. As usual, there were two entry groups, KS3 and KS4 (S1/2 and S3/4 in Scotland). Entries were received from 58 establishments in England, Wales, Scotland & Northern Ireland and from France; 10 schools submitted entries to both entry groups. In total, there were 291 separate entries consisting of 201 in the KS3 (S1/2) group and 90 at KS4 (S3/4). Many participants took the opportunity to work together in groups of up to 4, making a total of 510 students having entered the competition. MiSAC would like to thank teachers for providing information on the entry form about how they heard of the competition; it is useful to us that it helps us target efficient publicity of the competition for subsequent years. Judging, which took place at the University of Reading, was again hosted by the NCBE, one of MiSAC's sponsors. The judging panel consisted of Emeritus Professor Anthony Whalley, Liverpool John Moores University, Dr Fiona Lane, Head of the NCBE and Stephen Bullock, Microbiology Manager of Thames Water, together with officers of MiSAC.

The requirement was to produce information for an illustrated, web-page report explaining to teenagers

the importance of microbial activities in the water cycle and processes involved in reusing water supplies. The report had to include a brief outline of the main features of the natural water cycle; a labelled illustration was sufficient. Students then had to explain how the activities of microbes involved in the cycling of water had either a beneficial or a detrimental effect - on water quality and/or to humans and other animals. They had to identify these microbes (ie, protozoa, bacteria, algae, etc), where possible giving their scientific names, and also describe where they are found in different stages of the water cycle and associated water treatments.

Students who produced the most-effective web-page reports carefully studied the different stages of the water cycle/water-treatment processes. They identified where different microbes were actively involved and explained how their actions contributed to purifying the water, had harmful effects in eutrophicated water and identified beneficial activities for humans and other animals. However, there was a substantial number of entries which made no attempt to outline the water cycle. Some students concentrated solely on describing the natural water cycle and failed to discuss microbial activities at all. Others presented meticulously-labelled diagrams of protozoa, algae and bacteria but did not offer any insights into how these microbes were involved in improving or harming water quality. Students regularly focused on pathogenic microbes, often producing lists of the diseases they cause, but some did not attempt to link their activities to the water cycle or to aspects of sewage treatment.

Many students demonstrated that they have learned how to write correctly genus and species names, such as *Pseudomonas syringae*, using an italic font and the appropriate initial letters of each word - but this skill has not always become habitual. Some students used an italic font to type all microbe names and then underlined these names as well, which is only required if the words

are hand written. However, for a considerable number of their students, teachers must continue to emphasise how microorganisms are to be correctly named when typed or hand written. Judges commented on the number of times they had encountered “a bacteria” or even “the bacteriums”.

The competition entry had to be printed on one A3 sheet (or two A4 pages attached side-by-side), using only one side of the paper and could be prepared either by computer or by hand. Most entries were of the required format but students who choose to write material on the reverse of their entry should be discouraged from this practice. (The material on the reverse was usually a list of sources used in the student’s researches - an admirable feature which all students should consider including, but it should be placed where it can be seen!) Similarly, students who expanded the available surface area, for example, by creating a series of flaps which the reader had to lift, should be told that these are not recommended.

The creation of a well-designed, eye-catching, illustrated entry is not an easy task. The 2023 cohort of prize winners, and those students who gained a commendation for their entries, are to be congratulated for the high standards they achieved. There were also many exceptional entries that just failed to gain sufficient credit for an award. The biggest challenge is deciding on the right amount of textual information to include, whilst allowing sufficient space for attractive illustrations to produce an entry which has an immediate visual impact. In their online searches, many students found a great deal of useful and interesting information. Some felt compelled to communicate everything they had learned. Inevitably, this resulted in the use of a smaller font to fit in all the information and the reduction of illustrations, in size and number. Students should also be restrained in their choice of colours for their entries; multiple-background shades and too many different coloured fonts for the overlaid text make the information extremely difficult to read.

The judges were again impressed by the imagination and creativity of the students as they set about producing their entries. Many showed remarkable technical skills in using their computer to design their submission. A pair of collaborating students showed their technological initiative by incorporating a QR code which actually worked with a smartphone to connect to URLs giving further information. Those who chose to work by hand could also achieve great results. Some schools integrate the MiSAC competition into their science curriculum; teachers tell us of the pride of their students in the quality of their work in producing their entries.

We should like to thank teachers for responding to the request to record full identification details on the back of each entry which eases the administration of several hundred entries, many involving more

than one student. Only one aspect sometimes causes problems: our ability to decipher teachers’ hand writing of their e-mail addresses and in the spelling of their students’ names. The latter is particularly important in the production of certificates for those students who were awarded prizes or commendations for their excellent entries and also for the certificates of entry issued to all other students, by which MiSAC acknowledges their contribution to this competition. We would also again thank teachers and students for their support of the competition. A total of £1415.00 was awarded to prize winners and their establishments, and several entries gained a high commendation for their design or content.

Winning and commended entries are displayed on the MiSAC web site [www.misac.org.uk](http://www.misac.org.uk), which includes a list of the prize-winning students and their schools. MiSAC thanks the students for making the competition a success and their teachers for their support. We look forward to entries for the next MiSAC competition in 2024, which will explore the microbes causing neglected tropical diseases, sponsored by the Wellcome Centre for Integrative Parasitology.

Prizes and commendations were awarded to students from the following schools.

**Key Stage 3 Group:** *Joint First Prize* - Mohammed Zayan Raja - Boston Grammar School, Lincolnshire and Devayan Chatterjee - Reading School, Berkshire; *Third Prize* - Mieke Houghton, St Nicholas’ School, Hampshire. *Highly Commended for Design & Creativity* - Yashita Ghate, Herschel Grammar School, Slough, Berkshire; *Highly Commended for Scientific Merit* - Lauren Wong, Colchester County High School for Girls, Essex.

**Key Stage 4 Group:** *First Prize* - Darrell D’Cunha, Jacob Barry, William Stone & Benjamin Kangayan, St Bede’s Inter-Church School, Cambridge; *Second Prize* - Edward Pedopillai & Nemmat Tabandeh, King’s College School, Wimbledon, London; *Third Prize* - Jessica Yu, Guildford High School, Guildford, Surrey. *Highly Commended for Design & Creativity* - Zaynab Ahmed, Al-Khair Secondary School, Croydon and Lilla Nemes, Sophie Eggington, Larissa Sands & Ella Dutton, St Bede’s Inter-Church School, Cambridge. *Highly Commended for Scientific Merit* - Sophia Lau & Christine Deng, Concord College, Shrewsbury, Shropshire.

## MiSAC publications

### MiSAC matters Articles:

New materials have extended the current collection. *Hiding in Plain Sight: How parasites have evolved to outsmart their hosts*, has been written by Hannah Bialic, Public Engagement Manager, Wellcome Centre for Integrative Parasitology.

Dr Tansy Hammarton, Glasgow University, has produced three MiSAC matters articles to provide an introduction to molecular biology approaches in parasitic protozoa.

1. *Investigating gene function in protozoan parasites - general approaches and challenges;*
2. *Molecular genetic methods for analysing gene function in protozoan parasites;*

3. *Visualising proteins in protozoan parasites*. These will shortly be available on the MiSAC website.

Hannah Bialic has also written a new **MiSAC briefing**: *As the World Warms - Diseases will Spread*. This describes how climate change will affect tropical diseases and will be a useful reference to support students in next year's annual competition.

The first of a new series of publications, **MiSAC methods 1**: *Looking at microbes*, which describes preparing materials and cultures for microscopic examination, has been added to the MiSAC web site. **MiSAC methods 2**: *Sourcing, maintaining and using microbes*, which outlines laboratory methods for investigations with bacteria & fungi, should follow in due course.

**MiSAC fun microbiology**. These materials have been added to the MiSAC web site which includes a *Microbial Snakes and Ladders* game, a *Microbe Wordsearch* activity, *Building a Microbe Mobile* and *Does Size Matter?* which explores the sizes of microbes. Additional materials are in preparation.

**MiSAC activities 5**: *Spoilage of oranges*: This practical activity will investigate the infection of orange tissues by the fungus *Penicillium digitatum*. The possibility of the NCBE providing the culture is being explored.

An attractive **MiSAC publicity leaflet**, *Interested in Microbiology?*, has also been created which will help MiSAC and its sponsors to spread the word about MiSAC activities throughout schools in the UK and internationally.

## MiSAC web site

Work has continued with Indent Design Ltd to update pages on the site. New publications, described earlier, are now available for download. The Annual Competition page now includes details of the 2023 competition, a slideshow of their entries and a report of the outcome of the judging. The publicity flyer for the 2024 competition *Neglected Tropical Diseases & Climate Change* has now been added to the competition page. In addition, the Health & Safety page now has details of videos on microbiology practical techniques, sponsored by the Microbiology Society, which can be viewed on *YouTube*.

A report of the recent SEAMEO competition in SE Asia, *Vaccines: fighting disease*, in which students created 3-minute videos, will shortly be added to the international competitions in Asia section on the MiSAC website competition page.

## Advisory work

Margaret Whalley has continued to work with UNESCO South East Asia Ministries of Education Organisation (SEAMEO) STEM-ED as the lead organiser in the production of microbiology

materials for secondary schools in its partner countries. Following the recent pandemic and its control by the development of new vaccines, the focus of the SEAMEO STEM-ED Microbiology Programme was to increase, among teenagers, the knowledge of vaccines and the understanding of their importance in controlling infection in children.

The *Vaccines: fighting disease* programme was delivered in 11 SEAMEO partner countries in SE Asia. Teachers were trained by programme-specific videos and an online workshop. Following a period when the topic was taught in school, students aged 12-14+ were asked to produce a 3-minute video, aimed at fellow teenagers, explaining the human body's immune response and the way in which vaccines work in controlling childhood diseases. Student videos were submitted in April, judged in May and results announced at the beginning of June. Judges were very impressed with students' enthusiasm, imagination and technological skills in the way they imparted important information, especially since voice-overs or sub-titles had to be in English, not their native language.

Videos covered a range of childhood diseases for which vaccination was required. Marks were awarded for scientific content, creativity and for how well information was communicated. First prize (400 US\$) was awarded to three Thai students aged 13 for their attractive video on polio. Second prize (300 US\$) was won by a humorous video from Singapore in which 'Rap' was used to deliver the message on MMR. The third prize (200 US\$) went to Thai students who delivered their video on polio as part of a newscast, similar to the ones delivered during the recent pandemic.

## Future activities

MiSAC is delighted to report that for the annual competition in 2024, the Wellcome Centre for Integrative Parasitology has agreed to sponsor a parasite-themed poster competition: *Neglected Tropical Diseases & Climate Change*. The publicity flyer has already been prepared and is now available to download from the MiSAC website. MiSAC can also report that the long-standing support offered by the British Mycological Society has been strengthened by its decision to sponsor the annual competition in 2025 which will explore the theme of antifungal resistance.

**A Microbiology in Schools Grant** will be offered to schools and colleges in which they can bid for funds to improve the study of microbiology in their institution. Such bids might include the following.

- Equipment, eg, a replacement/additional hotplate & pressure cooker or a larger autoclave;
- Enhancing the observation of microorganisms with a superior microscope, upgrading optics with oil-immersion objective lenses &/or the provision of a microscope camera for better display facilities;
- Extending the range of microbial cultures/media to investigate new practical activities;

- Exploring kits of biotechnology applications from the NCBE or elsewhere;
- Funding technician/teacher attendance on microbiology-training courses.

It is anticipated that, initially, the total grant should be £5000. A decision has yet to be made about the number of individual grants to be established, and the maximum amount that each will award. A school applying for a grant will be asked to provide information about its type (eg, academy, voluntary-aided, independent, etc), size and curriculum, how much funds the biology department receive annually, how well equipped it already is for practical microbiology, and also estimate the number of students who would benefit, if it is successful. A school receiving a grant should compile a report of how it is used, so that MiSAC gains evidence that the funding is being used appropriately.

MiSAC will provide guidance to schools on how to submit a successful bid for funding, with a new MiSAC website page created to feature the microbiology grant. Publicity will commence in the spring/summer terms of 2024, with successful bids for a grant awarded in the autumn term 2024.

As far as possible, activities that could not take place because of the effects of Covid-19, will be reinstated. For example, a microscopy workshop for teachers and technicians, arranged in association with the Quekett Microscopical Club, has yet to be rearranged.

### **Finance and sponsorship**

The sponsorship of our competitions in 2023 and 2024, mentioned under '*Future activities*', has considerably improved MiSAC finances.

MiSAC relies on the much-appreciated support from its annual sponsors:

- *British Mycological Society (BMS)*,
- *British Society for Parasitology (BSP)*,
- *CLEAPSS*,
- *Microbiology Society (MS)*,
- *NCBE*,
- *The Quekett Microscopical Club (QMC)*,
- *SSERC*.

Their generosity provides an annual financial contribution, meeting rooms and laboratory facilities.

Costs to sponsors of the annual competition have been reduced by requiring schools to print the certificates that entrants receive.

The annual return was made to the Charity Commissioners.

### **MiSAC Committee**

Christian Von-Trotha-Taylor has replaced Nathan Smith as the representative of the BMS. Ben Chantrell has recently become the biology section lead at CLEAPSS, replacing Jason Harding.

### **Committee membership 2022-2023 (with affiliations)**

Chairman	John Grainger, MBE (University of Reading)
Vice-Chairman:	John Schollar (NCBE)
Secretary:	John Tranter (ASE)
Treasurer:	Margaret Whalley (BMS)
Lay members:	Christian Von-Trotha-Taylor (BMS) Jo Hamilton (BSP) Ai-Linh Tran/ Ben Chantrell (CLEAPSS) Tansy Hammarton (MS) Fiona Lane (NCBE) Phil Greaves (QMC) Annie McRobbie (SSERC)

### **Acknowledgements**

MiSAC is most grateful to its sponsors for their continued support. The generous amount of voluntary time, willingly given by the MiSAC Officers and the other Committee members, is also gratefully acknowledged. In addition, we greatly appreciate the work of the Honorary Auditor.